

REMARKS/ARGUMENTS

This amendment is filed under 37 CFR § 1.116(b)(2) to place previously presented Claim 11 in better form for appeal. Entry of this amendment is respectfully requested.

Previously presented Claim 11 depends upon previously presented dependent Claim 2. Previously presented Claim 2 depends upon previously presented independent Claim 1. Accordingly, as proposed, previously presented Claim 1 is hereby amended to incorporate all the limitations of previously presented dependent Claims 2 and 11; previously presented Claims 2 and 11 are hereby cancelled; and previously presented duplicate Claims 12 and 17 are hereby cancelled. In addition, previously presented Claim 14 is hereby amended to change its dependency from canceled Claim 2 to currently amended Claim 1. Accordingly, the broadest claim proposed by this amendment corresponds to previously presented dependent Claim 11 in independent form. Entry of this amendment is respectfully requested to put this case in better form for appeal.

Upon entry of this proposed amendment, Claims 1, 4-6, 8-10, 14, 16, and 19-20 are pending in the Application and remain finally rejected under 35 U.S.C. § 103.

No new matter is added.

Rejections of Previously Presented Claims 1-2, 4-6, 8-12, 14, 16-17, and 19-20

Previously presented Claims 1-2, 4-6, 8-12, 14, 16-17, and 19-20 were rejected under 35 U.S.C. § 103 over GB'271 (UK 1,197,271, published July 1, 1970) in view of Mangold (U.S. Patent 6,328,944, issued December 11, 2001). Office Action, dated December 7, 2009 (OA), page 2. The rejection, as it applies to herein proposed Claim 1, and all claims dependent thereon, should be withdrawn.

In proposed amended Claim 1, the column is heated in such a manner that (1) the temperature difference $T_{\text{bottom}} - T_{\text{top}}$ between the lower part and the upper part of the column is from 50°C to 100°C, (2) the maximum temperature in the column is in the lower part of the

column, (3) the maximum temperature in the column is from 350°C to 450°C, and (4) the metal oxide particles have a residence time in the column of from 1 second to 30 minutes. Thus, as proposed, amended Claim 1 incorporates all the limitations of previously presented dependent Claim 11. Therefore, the column must now be heated in such a manner that the temperature difference $T_{\text{bottom}} - T_{\text{top}}$ between the lower part and the upper part of the column is a minimum of 50°C, the maximum temperature in the column is in the lower part of the column, and the maximum temperature in the column is 450°C. Accordingly, the maximum temperature in the lower part of the column is 450°C and the maximum temperature in the upper end of the column is less than 400°C.

Given the Examiner's finding that "a temperature gradient would be produced [in a vertical column heated by burners at its bottom end], with a higher temperature at the bottom of the column and a lower temperature at the top" (OA, pp. 4-5, bridging ¶), the maximum temperature in the upper end of the vertical column employed in Applicant's proposed claimed process must be less than 400°C.

Applicant's Specification teaches (Spec., p. 4, ll. 16-26):

The process according to the invention can preferably be carried out in such a manner that the temperature difference $T_{\text{bottom}} - T_{\text{top}}$ between the lower part and the upper part of the column is from . . . 50°C to 100°C.

The temperature T_{bottom} is determined at a measuring point located from 10 to 15 %, based on the overall height of the column, above the bottom end of the column.

The temperature T_{top} is determined at a measuring point located from 10 to 15 %, based on the overall height of the reactor, beneath the upper end of the reactor.

Accordingly, as claimed, the temperature T_{top} is determined at a measuring point located from 10 to 15 %. Therefore, the maximum temperature at the top of the column, which is at least 10% higher than the measuring point at which T_{top} is determined, must be lower than 400°C..

A maximum temperature of less than 400°C at the top of the column employed in Applicant's claimed process is significant in this case because the primary reference relied

upon by the Examiner to establish the obviousness of Applicant's claimed process (GB'271) teaches "a treatment zone heated to 400 to 600°C" (GB'271, p. 2, ll. 63-64). GB'271 explains:

[T]he oxide . . . is introduced into a treatment zone heated to 400 to 600°C., in which it descends under gravity in counter-current to the ascending stream of a mixture of steam and a gas which is inert to the oxide . . . [GB'271, p. 2, ll. 62-67;].

The temperature required for treatment was reduced from the 600-800°C. commonly used in the fluidized bed process, to from 400 to 600°C. in the vertical tube process . . . [GB'271, p. 2, ll. 96-100;]

[T]he apparatus used is subjected to less thermal stressing in . . . that the treatment temperature is reduced from the original 600-800°C. to from 400 to 600°C. . . . [GB'271, p. 2, ll. 116-120.]

Moreover, the silicon dioxide treatment according to Example 1 of GB'271 includes the following statement (GB'271, p. 3, ll. 31-35; emphasis added): "The temperature of 400-600°C., is maintained inside the treatment zone by means of an externally mounted electrical resistance heating system (heating coils in quartz tubes)." The silicon dioxide treatment according to Example 2 of GB'271 states (GB'271, p. 3, ll. 80-82; emphasis added): "A temperature of 400-600°C., is maintained inside the treatment zone." The titanium dioxide treatment according to Example 3 teaches (GB'271, p. 3, ll. 94-97; emphasis added), "The treatment zone is externally heated to 600°C., by means of an electrical resistance heating system." The aluminum oxide treatment according to Example 4 teaches (GB'271, p. 3, ll. 94-97; emphasis added), "The temperature of the combustion gases, nitrogen and steam, ascending through the treatment zone, is about 600°C.." GB'271 does not suggest anywhere in its disclosure that the temperature in the treatment zone may fall below 400°C. as the Examiner indicates would be expected at the top of the vertical column employed in Applicant's claimed process.

Nevertheless, in regard to previously presented Claim 11, the Examiner states (OA, p. 5, last ¶), "GB'271 teaches a reactor temperature of 400-600°C. See page 2, lines 96-99.

Overlapping ranges are *prima facie* obviousness. MPEP 2144.05.” The Examiner misses the point of the GB’271 disclosure. First, as stated above, there are no overlapping ranges in the respective columns. Second, unlike Applicant’s column, GB’271 does not teach that the temperature at the top of the column may fall below the range of 400-600°C.. To the contrary, GB’271 teaches that “[a] temperature of 400-600°C., is maintained inside the treatment zone by means of an externally mounted electrical resistance heating system” (GB’271, p. 3, ll. 31-34; emphasis added). At page 3, lines 8-14, GB’271 teaches (emphasis added):

The treatment temperature may be maintained by means of an externally mounted electrical resistance heating system or alternatively by an internal heating system in which hydrogen is burnt in two vertically adjacent burners at the lower end of the treatment zone. . . . In the latter case combustion of the hydrogen provides steam for the treatment.

In Examples 1-2, GB’271 maintained a temperature inside the treatment zone of 400-600°C by an external electrical resistance heating system. In Example 3, GB’271 maintained a temperature inside the treatment zone of 600°C by an external electrical resistance heating system. In Example 4, GB’271 maintained a temperature inside the treatment zone of 600°C. by hydrogen combustion gases using two internal vertically adjacent hydrogen burners in the lower end of the treatment zone (GB’271, p. 3, ll. 109-114). “The temperature of the combustion gases, nitrogen and steam, ascending through the treatment zone, is about 600°C.” (GB’271, p. 3, ll. 117-120; emphasis added). From its teaching as a whole, GB’271 would have taught persons having ordinary skill in the art that the temperature “through the treatment zone” inside the column must be maintained from 400-600°C. The Examiner’s apparent finding that the temperature somewhere in the reaction zone may not be maintained within the range of 400-600°C is inconsistent with the teaching of GB’271 as a whole and clearly erroneous.

In addition, the Examiner acknowledges (OA, p. 3), “GB’271 is silent in regard to the temperature difference between the bottom and the top of the column and the residence time of the particles.” Nevertheless, to satisfy the deficient teaching of GB’271, the Examiner states (OA, p. 4, 1st full ¶):

In regard to the temperature difference, GB’271 teaches providing heat in two vertically adjacent burners located at the lower end of the treatment zone (the bottom). See page 3, lines 8-17. Thus, a temperature gradient would be produced, with a higher temperature at the bottom of the column and a lower temperature at the top. In a reaction column of sufficient size, like the 300L tube used in Example 1, and with the feeding rates of Example 1, a temperature difference between the top of the column and the bottom of the column of at least 20°C would necessarily be produced. Furthermore, the temperature profile of a continuous chemical system is a parameter that is routinely optimized in the chemical art, affecting the efficiency of the operation of the system, and fails to produce an unexpected result.

First, the Examiner will note that the temperature difference $T_{\text{bottom}} - T_{\text{top}}$ between the lower part and the upper part of the column employed in Applicant’s claimed process is now a minimum of 50°C.. That minimum temperature differential is significantly more than persons having ordinary skill in the art would have expected when maintaining a temperature in the range of from 400-600°C. using external electrical resistance heaters (GB’271, Examples 1-2), maintaining a temperature of 600°C using external electrical resistance heaters (GB’271, Example 3), or maintaining a temperature of 600°C using internal hydrogen combustion burners producing combustion gases, nitrogen and steam (GB’271, Example 4; p. 3, ll. 117-120).

The Examiner suggests, however, that it is within the ordinary skill of the artisan to optimize the temperature profile in the column in view of the teaching in GB’271 because temperature is recognized as a result effective variable (OA, p. 8, ¶¶1-3). By electing to maintain a temperature in the range of from 400-600°C through the column, GB’271 has already reduced the limits of conventional treatment at a temperature from 600-800°C. to 400-600°C (GB’271, p. 2, ll. 96-100; p. 2, ll. 100-128). Attempts to further reduce the temperature inside the column by increasing the temperature differential inside the column

and the residence time inside the column gives no credence to the experimental basis for the teaching in GB'271 and contradicts the teaching of GB'271 to maintain the treatment temperature inside and through the column in the range of 400-600°C., preferably maintained at about 600°C for titanium dioxide by resistance heating and for aluminum oxide by hydrogen combustion burners (GB'271, Examples 3-4, p. 3, ll. 90-124).

GB'271 describes no temperature differential at all in the treatment zone of its columns. To reasonably expect persons having ordinary skill in the art to contradict the teaching of GB'271, presume without basis that a temperature differential in the column is a result effective variable and has a significant effect, and optimize that result effective variable, does not rise to a weak obvious-to-try situation. Obviousness requiring a suggestion to do what Applicant has done with a reasonable expectation of success is entirely out of the question. *See In re O'Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988)(obviousness requires both a reasonable suggestion to do it and a reasonable expectation of success).

The Examiner erroneously finds that persons having ordinary skill in the art lack common sense. Persons having ordinary skill in the art are presumed to have common sense and act accordingly. *In re Sovich*, 769 F.2d 738, 742-43 (Fed. Cir. 1985); *In re Bozek*, 416 F.2d 1385, 1390 (CCPA 1969). Moreover, persons having ordinary skill in the art seek to improve on what is already known. *In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003). To optimize the temperature differential between the upper and lower parts of a column, the prior art must first recognize that temperature differentials may be optimized to achieve a better result. To reduce the temperature at the entrance at the upper end of a column below the lowest limit required by the prior art, persons having ordinary skill in the art must reasonably expect a successful result. In this case, neither GB'271 alone, nor GB'271 combined with Mangold, provides incentive to optimize temperature differential or reduce the minimum required temperature in the column with reasonable expectation of success.

Accordingly, the Examiner has not met his initial burden of proof to establish a prima facie case for obviousness.

Furthermore, even if GB'271 arguably could be said to establish the prima facie obviousness of the process Applicant claims, Applicant's Specification shows that unexpected results are achieved when treating silicon dioxide, titanium dioxide, and aluminum oxide particles by the process Applicant now claims.

Applicant's Inventive Example 1 (Spec., p. 6, ll. 11-24) and Inventive Example 6 (Spec., p. 7, ll. 19-34) describe counter-current processes for treating silicon dioxide in accordance with proposed Claim 1 wherein the T_{bottom} is 425°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 75°C.

Comparative Example 2 (Spec., p. 6, ll. 25-26) describes a counter-current process for treating silicon dioxide wherein the T_{bottom} is 680°C, T_{top} is 670°C, and $T_{bottom} - T_{top}$ is 10°C..

Comparative Example 3 (Spec., p. 6, l. 27, to p. 7, l. 5) describes a co-current process for treating silicon dioxide wherein the T_{bottom} is 425°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 75°C..

Applicant's Inventive Example 4 (Spec., p. 7, ll. 6-11) describes a counter-current process for treating aluminum oxide in accordance with proposed Claim 1 wherein the T_{bottom} is 425°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 75°C.

Applicant's Inventive Example 5 (Spec., p. 7, ll. 12-18) describes a counter-current process for treating titanium dioxide in accordance with proposed Claim 1 wherein the T_{bottom} is 400°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 50°C.

The evidence in the Table on page 8 shows that the processes of Inventive Examples 1 and 6 (T_{bottom} is 425°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 75°C.) reduced the pH of silicon dioxide powder from 1.6 to 4.2-4.3 which is comparable to the pH reduction of silicon

dioxide powder from 1.9 to 4.0-4.2 achieved in GB'271 Examples 1 and 2 (T_{bottom} is 400-600°C, T_{top} is 400-600°C, and $T_{bottom} - T_{top}$ is 0°C.).

The evidence in the Table on page 8 shows that the processes of Inventive Examples 1 and 6 (T_{bottom} is 425°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 75°C.) and Comparative Example 2 similarly reduced the chloride content from 0.1 to 0.001 wt.% (T_{bottom} is 680°C, T_{top} is 670°C, and $T_{bottom} - T_{top}$ is 10°C.). However, the thickening effect of silicon dioxide treated by Inventive Examples 1 and 3 on solutions of unsaturated polyester resins was substantially better than the thickening effect of silicon dioxide treated by Comparative Example 2.

The evidence in the Table on page 8 shows that Inventive counter-current Examples 1 and 6 (T_{bottom} is 425°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 75°C.) reduced the chloride content far better than Comparative co-current Example 4 (T_{bottom} is 425°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 75°C.), and the thickening effect of silicon dioxide treated by Inventive counter-current Examples 1 and 3 on solutions of unsaturated polyester resins was substantially better than the thickening effect of silicon dioxide treated by Comparative co-current Example 3.

The evidence in the Table on page 8 shows that Inventive Example 4 (aluminum oxide; T_{bottom} is 425°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 75°C) and Inventive Example 5 (titanium dioxide; T_{bottom} is 400°C, T_{top} is 350°C, and $T_{bottom} - T_{top}$ is 50°C) comparably reduced the chloride content while maintaining column temperatures much lower than the 600°C maintained in corresponding Examples 3 and 4 of GB'271.

Thus, the evidence in the Table at page 8 of Applicant's Specification shows that the pH and chloride content of silicon dioxide, titanium dioxide and aluminum oxide powders are reduced by Applicant's claimed process to the same level of pH and chloride content reduction achieved by the processes of Examples 1-4 of GB'271. However, Applicant's claimed process unexpectedly achieved the same result at much reduced column temperatures. The evidence of record as a whole rebuts whatever *prima facie* case of

Application No. 10/567,577
Reply to Office Action of December 7, 2009

obviousness of Applicant's claimed process that may be established in view of the combined teachings of GB'271 and Mangold.

For the reasons stated herein, the proposed amendments should be entered of record. The claims, as amended, are patentable over the applied prior art and in condition for allowance. Early Notice of Allowance is respectfully requested.

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